

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
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## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) **17. 5. 2005**

Applicant's or agent's file reference  
R631-PCT

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.  
PCT/JP2005/003255

International filing date (day/month/year)  
22.02.2005

Priority date (day/month/year)  
24.02.2004

International Patent Classification (IPC) or both national classification and IPC  
Int.Cl.<sup>7</sup> H01L33/00, 21/28

Applicant  
SHOWA DENKO K.K.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Date of completion of this opinion **28.04.2005**

Name and mailing address of the ISA/JP

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/JP2005/003255

**Box No. I      Basis of the opinion**

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
  
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  
  - b. format of material  
☐ in written format  
☐ in computer readable form
  
  - c. time of filing/furnishing  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
  
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
  
4. Additional comments:

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**Box No. V** Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	4-7, 9, 15	YES
	Claims	1-3, 8, 10-14, 16	NO
Inventive step (IS)	Claims		YES
	Claims	1-16	NO
Industrial applicability (IA)	Claims	1-16	YES
	Claims		NO

2. Citations and explanations

D1: JP 10-303504 A  
D2: JP 10-084160 A  
D3: JP 11-220168 A  
D4: JP 2001-284642 A  
D5: JP 2000-058911 A

The subject matter of claims 1-3, 8, 10-14 does not meet the requirement of novelty.

(With regard to the invention in claims 1, 12, 14)

D1 discloses GaN group compound semiconductor device comprising an electrode structure provided on a p-GaN layer, and the electrode structure consisting of a Pt layer and a Pt/Ga compound layer which are formed by RF sputtering and annealing process, respectively.

(With regard to the invention in claims 2, 3, 8, 10, 11, 13)

Considering that the semiconductor device disclosed in D1 realizes a low contact resistivity of about  $5 \times 10^{-4} \Omega \text{ cm}^2$ , which is almost the same value disclosed in the application concerned, it is recognized that the semiconductor device disclosed in D1 has the same constituent features as the subject matter of claims 2, 3, 8, 10, 11, 13.

The subject matter of claim 16 does not meet the requirement of novelty.

D2 discloses GaN group compound semiconductor light-emitting device comprising a p-type GaN contact layer, a Pt layer and an alloy layer of Pt-semiconductor, the alloy layer is formed by thermal treatment at 350°C.

The subject matter of claim 9 does not involve an inventive step over D1, D2 for the following reasons.

D2 discloses that a nitrogen atom diffuses upward from the p-type GaN contact layer by annealing process (see [0029]). Therefore, it is the matter of workshop modification that adding a nitrogen atom to the Pt/Ga compound layer disclosed in D1 by annealing process.

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**Box No. VIII**    **Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

On page 14 lines 32-34, it is described that Pt(222) plane lattice spacing is smaller in DC film than in RF film, while Table 3 shows that the plane lattice spacing is larger in DC film(the value is 1.138) than in RF film (the value is 1.128).

Therefore, the description on page 14 lines 32-34 is inconsistent with Table 3.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box No.V 2.

The subject matter of claims 4-7 does not involve an inventive step over D1, D3 for the following reasons.

D3 discloses GaN group compound semiconductor device comprising an electrode structure provided on a p-GaN layer, and the electrode structure said above including a thin metal layer and a thick metal layer. D3 also discloses that the thin metal layer comprises at least one metal selected from the group consisting of Pt, Pd, and Re, and the thick metal layer comprises at least one metal selected from the group consisting of Pt, Pd, Ag, and Rh.

Therefore, the person skilled in the art would easily conceive the idea of applying the electrode structure described in D3 to the invention disclosed in D1.

The subject matter of claim 15 does not involve an inventive step over D1-D5 for the following reasons.

D4 discloses that sputtering type (RF sputtering or DC sputtering) can be selected for each layer (see [0059] in D4).

D5 discloses that DC sputtering is preferable from the viewpoint of productivity (see [0041] in D5).

Therefore, using RF sputtering for a thin contact metal layer and using DC sputtering for a thick reflecting layer are the matter of mere modification.